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375/130 (40) 310 13 46 135  
257, 295, 296  
370/335, 342

# CLAIMS

What We Claim:

1. A Rake receiver for performing a symbol combining function with respect to demodulated multi-path signals in a demodulation step of a code division multiple access(CDMA) communication system, being only one FIFO(First-In First Out) register that accumulates a plurality of previously-stored FIFO register values by using an adding part, and then stores the accumulated value in the FIFO register when storing a finger-demodulated symbol in the FIFO register.

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2. The Rake receiver according to claim 1, further comprising:  
a control logic part which determines the block position of the FIFO register where the transmitted symbol demodulated in each finger is to be stored, and outputs a combined symbol data after receiving an output signal.

3. The Rake receiver according to claim 2, wherein the control logic part includes a part which sequentially selects a symbol data of each finger to be combined, by using a writing signal and a symbol duration that are received from each finger.

4. The Rake receiver according to claim 2, wherein the control logic part includes a circuit for calculating a writing position of FIFO register by using a phase of PN code, a symbol duration, and a depth of FIFO register.

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5. The Rake receiver according to claim 4, wherein the circuit determines a writing position of the FIFO register by using following equation:

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$$W = \left( \left\lfloor \frac{P}{S} \right\rfloor - 1 \right) \bmod N$$

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where,  $[x]$  is a maximum integer below 'x',  $x \bmod y$  (modulo-operation) is a remainder when 'x' is divided by 'y', W is a variable indicating a storage position of a selected symbol data, P is a variable indicating a timing reference of each symbol by using a phase of PN code, S is a variable indicating a symbol duration, and N is a depth of the FIFO register.

6. The Rake receiver according to claim 1, further comprising:

a combiner for combining a symbol data demodulated in each finger with an output value of FIFO register.

7. A method of combining a symbol of demodulated multi-path signals in a demodulation step of CDMA communication system, comprising the steps of:

accumulating a plurality of previously-stored FIFO register values by using an adding part and then stores the accumulated value in the FIFO register, when storing a finger-demodulated symbol in the FIFO register.

8. The symbol combining method according to claim 7, further comprising the step of:

sequentially selecting a symbol data of each finger to be combined, by using a writing signal and a symbol duration that are received from each finger.

9. The symbol combining method according to claim 7, further comprising the step of:

calculating a writing position of the FIFO register by using a phase of PN code, a symbol duration, and a depth of FIFO register.

10. The symbol combining method according to claim 9, further comprising the step of:

determining a writing position of the FIFO register by using following equation:

$$W = \left( \left\lfloor \frac{P}{S} \right\rfloor - 1 \right) \bmod N$$

where,  $[x]$  is a maximum integer below 'x',  $x \bmod y$  (modulo-operation) is a remainder when 'x' is divided by 'y', W is a variable indicating a storage position of a selected symbol data, P is a variable indicating a timing reference of each symbol by using a phase of PN code, S is a variable indicating a symbol duration, and N is a depth of the FIFO register.

11. The symbol combining method according to claim 7, further comprising the step of:

combining a symbol data demodulated in each finger with an output value of the FIFO register.

12. A symbol combining method for driving a Rake receiver including only one FIFO register, accumulating a plurality of previously-stored FIFO register values by using an adding part and then storing the accumulated value in the FIFO register when storing a finger-demodulated symbol in the FIFO register, the method further comprising the steps of:

when storing data in the FIFO register after finishing a processing of the symbol data in an i-th finger, selecting a symbol data and a pseudo noise(PN) phase of the i-th finger; calculating a writing position of indicating a block of the register where the symbol data is stored, by using the selected PN code phase; and reading the data of the block located at the calculated writing position, combining the read block data with the symbol data to be stored, and storing a resultant value into the block located at the calculated writing position.

13. The symbol combining method for driving Rake receiver according to claim 12, further comprising the step of:

if at least two fingers ask a storage action at the same time, firstly processing a finger of a low number prior to a finger of a high number, and then processing the finger of a high number.

14. The symbol combining method for driving Rake receiver according to claim 12, wherein the step for calculating a writing position by using a selected PN code phase determines a writing position of the FIFO register by using following equation:

$$W = \left( \left\lfloor \frac{P}{S} \right\rfloor - 1 \right) \bmod N$$

where,  $[x]$  is a maximum integer below 'x',  $x \bmod y$  (modulo-operation) is a remainder when 'x' is divided by 'y', W is a variable indicating a storage position of a selected symbol data, P is a variable indicating a timing reference of each symbol by using a phase of PN code, S is a variable indicating a symbol duration, and N is a depth of the FIFO register.

15. A symbol combining method for driving a Rake receiver including only one FIFO register, accumulating a plurality of previously-stored FIFO register values by using an adding part and then storing the accumulated value in the FIFO register when storing a finger-demodulated symbol in the FIFO register, the method further comprising the steps of:

- a) when storing data in the FIFO register after finishing a processing of the symbol data in an i-th finger, selecting a symbol data and a pseudo noise(PN) phase of the i-th finger;
- b) calculating a writing position of indicating a block of the register where the symbol data is stored, by using the selected PN code phase;
- c) reading the data of the block located at the calculated writing position, combining the read block data with the symbol data to be stored, and storing a resultant value into the block positioned at the calculated writing position;

- d) repeating the steps (a), (b) and (c);
- e) upon generation of a reading signal, calculating a block position of FIFO register to be read; and (a)
- f) selecting a data located at the calculated block position of the FIFO register in the step (e), transmitting the data to a combiner, and then initializing the register.

16. The symbol combining method for driving Rake receiver according to claim 15, further comprising the step of:

if at least two fingers ask a storage action at the same time, firstly processing a finger of a low number prior to a finger of a high number, and then processing the finger of a high number.

17. The symbol combining method for driving Rake receiver according to claim 15, wherein the step for calculating a writing position by using a selected PN code phase determines a writing position of the FIFO register by using following equation:

$$W = \left( \left\lfloor \frac{P}{S} \right\rfloor - 1 \right) \bmod N$$

where,  $[x]$  is a maximum integer below 'x',  $x \bmod y$  (modulo-operation) is a remainder when 'x' is divided by 'y', W is a variable indicating a storage position of a selected symbol data, P is a variable indicating a timing reference of each symbol by using a phase of PN code, S is a variable indicating a symbol duration, and N is a depth of the FIFO register.

(18.) A computer-readable storage medium recording a program for executing a symbol combining of demodulated multi-path signals in a demodulation step of a CDMA communication system, wherein the program executes the steps of:

accumulating a plurality of previously-stored FIFO register values by using an adding part; and 102 (a)

storing the accumulated value in the FIFO register, when storing a finger-demodulated symbol in the FIFO register.

19. A computer-readable storage medium recording a program for executing a symbol combining method for driving a Rake receiver that includes only one FIFO register, and accumulates a plurality of previously-stored FIFO register values by using an adding part, and then stores the accumulated value in the FIFO register when storing a finger-demodulated symbol in the FIFO register, being characterized in that the program executes the steps of:

when storing data in the FIFO register after finishing a processing of the symbol data in an i-th finger, selecting a symbol data and a pseudo noise(PN) phase of the i-th finger;

calculating a writing position of indicating a block of the register where the symbol data is stored, by using the selected PN code phase; and

reading the data of the block located at the calculated writing position, combining the read block data with the symbol data to be stored, and storing a resultant value into the block located at the calculated writing position.

20. A computer-readable storage medium containing a program for executing a symbol combining method for driving a Rake receiver that includes only one FIFO register, accumulates a plurality of previously-stored FIFO register values by using an adding part, and then stores the accumulated value in the FIFO register when storing a finger-demodulated symbol in the FIFO register, being characterized in that the program executes the steps of:

a1) when storing data in the FIFO register after finishing a processing of the symbol data in an i-th finger, selecting a symbol data and a pseudo noise(PN) phase of the i-th finger;

b1) calculating a writing position of indicating a block of the register where the symbol data is stored, by using the selected PN code phase;

c1) reading the data of the block located at the calculated writing position, combining the read block data with the symbol data to be stored, and storing a resultant value into the block located at the calculated writing position.

d1) repeating the steps (a1), (b1) and (c1);

e1) upon generation of a reading signal, calculating a block position of FIFO register to be read; and

f1) selecting a data located at the calculated block position of the FIFO  
register in the step (e1), transmitting the data to a combiner, and then initializing the block.